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DECISION DOCUMENT
Battery Disposal Pit, SWMU A-09b
Hawthorne Army Depot
Hawthorne, Nevada
December 1999

1. PURPOSE of DECISION DOCUMENT

1.1 Introduction

This decision document describes the rationale for the remedial action at, and closure of, Solid Waste Management Unit (SWMU) A-09b, Battery Disposal Pit, at the Hawthorne Army Depot (HWAD), Hawthorne, Nevada. This decision document was developed by the U.S. Army Corps of Engineers, Sacramento District (USACE), HWAD, and Day & Zimmermann Hawthorne Corporation (DZHC), with support from the Nevada Department of Conservation and Natural Resources, Division of Environmental Protection (NDEP).

1.2 Site Description and Background

SWMU A-09b was an unlined earthen pit and is located 0.5 miles west of the 100 group area. The disposal area reportedly occupied a total area of approximately 1 acre. The pit was used as an open dumping ground for all types of batteries, smokeless powder (propellent), and rocket packing material. The pit was excavated and material removed in 1993.

The pit reportedly was in operation from the 1950s to the 1960s when dry cell batteries, rocket packing cork, smokeless powder, and small arms ammunition cans were disposed of by dumping down the slope of the pit. Some of the batteries had rusted, potentially releasing hazardous levels of lead and cadmium (USAEHA 1987 and 1988). SWMU A-09b was never permitted and has not gone through a formal Resource Conservation and Recovery Act (RCRA) closure, although the batteries were removed in 1993 during excavation of the pit.

A storm event in 1992 created a debris flood which eroded the entire north side of the pit, exposing a 10-foot high wall of batteries and rocket packing corks. During the debris flood, batteries and rocket packing corks were washed approximately 1,000 feet to the northwest through a flood channel. Subsequent to the flood, DZHC began drumming the exposed batteries. In 1992, DZHC postponed the cleanup to conduct toxicity characteristic leaching procedure (TCLP) analysis on representative battery types in an effort to characterize the batteries and minimize the quantity of hazardous waste. The results of the TCLP analysis on nine different types of batteries indicate that cadmium and/or lead could be leached from some of the batteries at concentrations exceeding maximum allowable TCLP criteria.

A sample of the rocket packing cork was also analyzed by DZHC for 2,4,6-TNT and 2,4-DNT. Neither contaminant was detected at a quantitation limit of 0.05 mg/kg. Following receipt of the analytical results, DZHC completed the battery cleanup between April and October 1993. During cleanup, a 25 x 120 x 2-3 foot deep area was excavated and remained open

and accessible. The area which contained batteries was approximately 15 by 100 feet and was on the south slope of the washed-out area.

Groundwater data obtained during the 1974 U.S. Geological Survey (USGS) pump test reported the depth to groundwater at approximately 70 to 80 feet below ground surface (bgs) in USGS wells 1, 2, and 3 located approximately 3,000 feet north-northwest of SWMU A-09b.

1.3 Chemicals of Concern

The chemicals of concern at SWMU A-09b are heavy metals which are associated with the batteries that had been buried at this location and explosives associated with rocket packing material.

2. SUMMARY of SITE RISK

The results of laboratory analyses show that no nitroaromatics were detected in soil samples collected at this SWMU. Cadmium was not detected in any of the soil samples at levels above the method detection limit. Three metals, arsenic, barium, and chromium (total), were detected in all of the soil samples at levels below the soil remediation criteria.

Beryllium was detected at concentrations ranging from 0.71 to 1.1 mg/kg. However, these detected concentrations are background ranges, based on comparison with the range of beryllium concentrations of <1 to 15 mg/kg found in the Western United States (USGS 1982).

Slightly elevated lead concentrations, with respect to other samples collected (ranging from 34 mg/kg to 62 mg/kg), were detected at all surface soil sample locations. At sample locations 1 and 2, as shown on Figure 3-3, these concentrations significantly decreased by one order of magnitude at 5 feet below ground surface (bgs). At sample location 3, the lead concentration increased to 160 mg/kg at 5 feet bgs which exceeds the soil remediation criteria of 100 mg/kg.

Based on the 5-foot hand auger samples and the 8 and 11 feet deep cone penetrometer test (CPT) sample results, the lead concentrations significantly decreased at the 5-foot depth within the battery disposal pit. At sample location 3, located downgradient of the battery disposal pit, the lead concentration (160 mg/kg) at 5 feet suggests that lead from the batteries may have migrated or been dispersed into the subsurface soils, or this anomaly may be from another source. This evaluation is based on a relative comparison with other samples collected. The lead concentration of 160 mg/kg is below the preliminary remediation goal (PRG) of 1000 mg/kg.

3. SUMMARY of REMEDIAL INVESTIGATIONS and REMEDIAL ACTIONS

3.1 Remedial Investigations

3.1.1 Objectives

The objective of the site investigation at SWMU A-09b was:

To determine the presence of heavy metals in the surface and subsurface soils as a result of the buried batteries.

To determine the presence of explosives in the surface and subsurface soils due to the presence of rocket packing cork.

This objective was met.

3.1.2 Actual Investigation

Surface samples were collected at three locations. Two of the locations were from the bottom of the excavated area and the third sample was from a depression located downstream from the washed out pit area. Hand auger samples were collected at these same three locations at the five-foot depth. One CPT sample hole was completed adjacent to the excavated battery disposal area as shown on Figure 3-3.
Samples were collected at the 8-foot and 11-foot depths in this hole.

3.1.3 Results

Soils encountered during the investigation of SWMU A-09b generally consisted of alluvial gravelly, coarse to fine sands with varying percentages of silt sized particles. At downgradient hand auger location 3, a much finer-grained clayey silt with little or no coarse-grained materials was encountered. Soils at this location appeared to have been deposited by recent flooding. Stained or unnaturally discolored soils indicative of explosives or bulk contamination were not encountered at the surface of this SWMU or in any of the hand auger holes. Therefore, TNT and RDX screening were not performed at this SWMU.

The results of laboratory analyses show that no nitroaromatics were detected in soil samples collected at this SWMU. These results are consistent with high explosives analyses of packing corks conducted by DZHC in 1992. Due to the recent removal of discarded batteries from the site in 1992 and 1993 and the indication that sampled batteries were capable of leaching lead and/or cadmium at concentrations exceeding maximum allowable TCLP criteria, metals analyses at this SWMU were of particular importance. Cadmium was not detected in any of the soil samples at levels above the method detection limit. Three metals, arsenic, barium, and chromium (total), were detected in all of the soil samples at levels below the soil remediation criteria.

Slightly elevated lead concentrations, with respect to other samples collected (ranging from 34 mg/kg to 62 mg/kg), were detected at all surface soil sample locations. At sample locations 1 and 2, these concentrations significantly decreased by one order of magnitude at 5 feet bgs. At sample location 3, the lead concentration increased to 160 mg/kg at 5 feet bgs.

Of the remaining metals which were detected at this SWMU (silver, beryllium, selenium and mercury), only beryllium was detected at levels above the PRG of 1 mg/kg. The samples containing high beryllium concentrations were collected from the surface and near-surface soils at downgradient hand auger location 3 (1.1 mg/kg in both samples).

3.2 Remedial Actions

3.2.1 Summary of Remedial Alternatives

The battery pit excavation should be backfilled with clean soil and contoured to the surrounding terrain.

3.2.2 Summary of Remedial Actions

The excavation was backfilled with clean soil and contoured to match the surrounding terrain. The packing corks remaining in the area were removed and landfilled. Photographs of the site before and after implementation of this remedial action are attached.

4. CONCLUSIONS and RECOMMENDATIONS

The HWAD proposed closure goals for all analytes are listed in Appendix A. These closure goals were used in evaluating the detected chemicals. Tables A09b-1 and A09b-2 list the detected parameters.

The elevated lead concentrations detected at the surface are potentially the result of leachate from the disposed batteries. Based on the 5-foot hand auger samples and the 8 and 11 feet deep CPT sample results, the lead concentrations significantly decreased at the 5-foot depth within the battery disposal pit. At sample location 3, located downgradient of the battery disposal pit, the lead concentration (160 mg/kg) at 5 feet suggests that lead from the batteries may have migrated or been dispersed into the subsurface soils, or this anomaly may be from another source. This evaluation is based on a relative comparison with other samples collected. The lead concentration of 160 mg/kg is below the proposed closure goal (PRG) of 1000 mg/kg.

Beryllium was detected at concentrations ranging from 0.71 to 1.1 mg/kg. However, these detected concentrations are background ranges, based on comparison with the range of beryllium concentrations of <1 to 15 mg/kg found in the Western United States (USGS 1982).

Because the batteries have been removed, the depth to groundwater is 81 feet, the detected lead concentrations appear to significantly decrease

Table A09b - 1

PARAMETERS DETECTED IN SURFACE AND NEAR SURFACE SOIL SAMPLES AT SWMU A-9B
CONCENTRATIONS IN mg/kg (ppm)

Sample No./ Parameter	A-9B HA1-1-000	A-9B HA1-1-005	A-9B HA1-2-000	A-9B HA2-2-000	A-9B HA1-2-005	A-9B HA1-3-000	A-9B HA1-3-005
Job Number	9400.875	9400.875	9400.875	9400.875	9400.875	9400.875	9400.875
Sample Depth (feet)	0.5 - 1.0	5.0 - 5.5	0.5 - 1.0	0.5 - 1.0 (duplicate)	5.0 - 5.5	0.5 - 1.0	5.0 - 5.5
Solids-Total (%)	95	95	96	97	98	90	86
pH	6.8 J	7.0 J	7.0 J	7.2 J	8.5 J	7.4 J	7.4 J
Nitrate-nitrogen	100 J	ND UJ	23 J	28 J	ND UJ	30 J	170 J
Metals							
Silver	ND	ND	ND	ND	ND	ND	3.6
Arsenic	4.1	1.6	3.1	3.0	1.0	14	12
Barium	63	67	47	53	43	320	510
Beryllium	ND	ND	ND	ND	ND	[redacted]	[redacted]
Chromium (total)	4.9	4.5	3.2	3.6	3.1	13	14
Lead	34 J	3.7 J	37 J	51 J	3.2 J	62 J	[redacted]
Selenium	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	0.97 J	ND UJ
Mercury	0.28	ND	ND	ND	ND	0.17	ND

NOTE: Nitroaromatics and picric acid were analyzed for; but not detected.

Key:

J - Estimated value.
ND - Not detected above quantitation limit. See Appendix B for quantitation limits.
UJ - Estimated value due to variance in QC limits.

Table A09b-2

PARAMETERS DETECTED IN CONE PENETROMETER SAMPLES AT SWMU A-9B
CONCENTRATIONS IN mg/kg (ppm)

Sample No./ Parameter	A-9B CPS1-1-0008	A-9B CPS1-1-0011
Job Number	9401.124	9401.124
Sample Depth (feet)	8.0 - 9.0	11.0 - 12.0
Solids Total (%)	91	86
pH	7.7 J	8.2 J
Nitrate-nitrogen	ND	ND
Metals		
Arsenic	1.2	9.2
Barium	78 J	160 J
Beryllium	ND	
Chromium (total)	4.7	7.0
Lead	2.9	10

NOTE: Nitroaromatics and picric acid were analyzed for; but not detected.

Key:

J - Estimated value.
ND - Not detected above quantitation limit. See Appendix B for quantitation limits.

with depth and are below the PRG, and the beryllium concentrations in 3 samples are within documented ranges of Western United States soils, no additional investigation is recommended.

It is recommended that the site be closed with respect to the chemicals of concern and without land use restrictions.

5. PUBLIC/COMMUNITY INVOLVEMENT

It is U.S. Department of Defense and Army policy to involve the local community throughout the investigation process at an installation. To initiate this involvement, HWAD has established a repository in the local public library, which includes final copies of all past studies and documents regarding environmental issues at the facility. This repository will be maintained and updated with all future final documents as they are issued to HWAD.

HWAD has solicited community participation in establishment of the restoration advisory board (RAB). However, because of insufficient public response, HWAD has not formed a RAB. HWAD will continue to solicit community involvement.

6. DECLARATION

The selected remedy is protective of human health and the environment. It has been shown that a complete exposure pathway to human health and the environment does not exist, and there is no potential for such an exposure pathway to be completed in the future.

U.S. ARMY

18 JAN 2000
Date

James A. Piner
Lieutenant Colonel, U.S. Army
Commanding

STATE OF NEVADA

22 MARCH 2000
Date

Paul Liebendorfer
Chief, Bureau of Federal Facilities

REFERENCES

Department of Defense, 1991, Special Nevada Report, DE-AC08-88NV10715.

Ecology and Environment, Inc., 1992, Site Visit and Interviews at Hawthorne Army Ammunition Plant.

Ecology and Environment, 1995, Final RCRA Facility Assessment Report for 9 Solid Waste Management Units, Hawthorne Army Depot.

National Climatic Data Center, 1994, Annual Climatological Survey, Hawthorne, Nevada, 1982 through 1990.

Nevada Division of Environmental Protection, 1992, Contaminated Soil and Groundwater Remediation Policy, June 25, 1992.

Ross, Donald C., 1961, *Geology and Mineral Deposits of Mineral County Nevada*, Nevada Bureau of Mines Bulletin 58.

Sisk, Wayne E., 1992, *Reactivity Testing and Handling Explosive-Contaminated Soil*, Proceedings of 1992 Federal Environmental Restoration Conference, April 1992, Hazardous Materials Control Resources Institute.

United States Army Corps of Engineers, 1994, Field Investigation Plan, RCRA Facility Assessment of 9 Solid Waste Management Units, Hawthorne Army Ammunition Plant, Hawthorne, Nevada. Sacramento District, Environmental Engineering Branch, DERP Section. Contract DACA05-91-D-0016, Delivery Order 13. April 8, 1994.

United States Army Environmental Hygiene Agency (USAEHA), 1987 and 1988, Final Report Ground-Water Contamination Survey Number 38-26-0850-88 Evaluation of Solid Waste Management Units, Hawthorne Army Ammunition Plant, Hawthorne, Nevada.

_____, 1992, Preliminary Assessment Screening Number 38-26-KS38-92, Babbitt Landfill, Hawthorne Army Ammunition Plant, Hawthorne, Nevada, 19-20 August 1992.

United States Department of Agriculture, Soil Conservation Service, 1991, Soil Survey of Mineral County Area, Nevada.

United States Geological Society, 1975, *Source of Nitrate in Water from Supply Well 8, Hawthorne Naval Ammunition Depot, Nevada;* Administrative Report, A. S. VanDenburgh and F. E. Rush, Carson City, Nevada, March 1975.

_____, 1976, *Groundwater Contamination by Percolating Explosives Wastes, Hawthorne Naval Ammunition Depot, Nevada, Phase I, Reconnaissance of the 103-41 Area;* Administrative Progress Report, A. S. VanDenburgh and R. R. Squires, Carson City, Nevada.

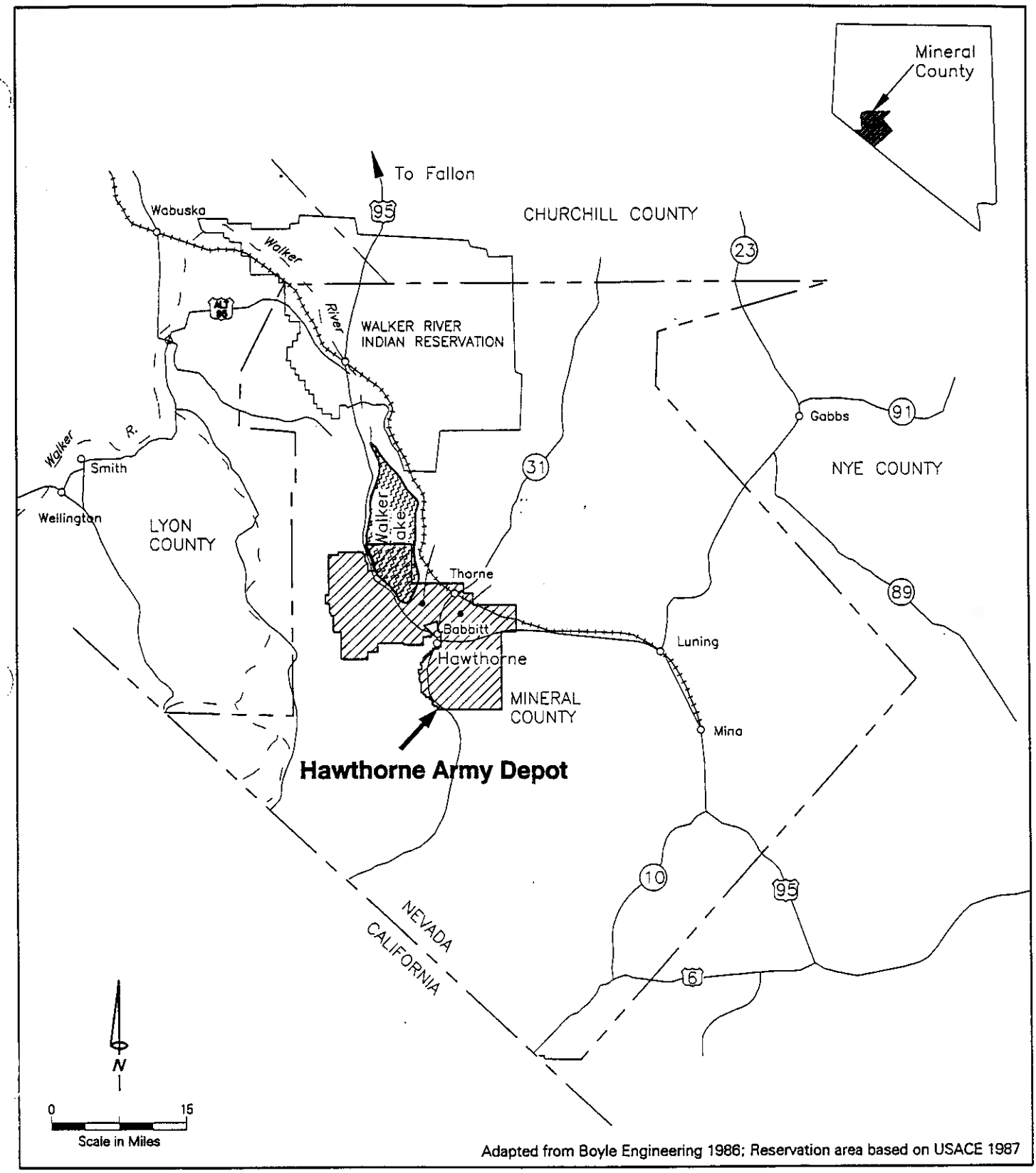
_____, 1980, *Ground-Water Contamination By Percolating Explosive Wastes, Hawthorne Army Ammunition Plant, Mineral County, Nevada, Phase I, II, and III.* VanDenburgh, A.S., et al., Carson City, Nevada.

_____, 1980, *Groundwater Contamination by Percolating Wastes, Hawthorne Army Ammunition Plant, Mineral County, Nevada, Phase IV, Reconnaissance Near Walker Lake; Administrative Report,* VanDenburgh, A.S., et al., Carson City, Nevada.

_____, 1982, *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States;* Professional Paper 1270.

Water Work Corporation, 1990, Summary Report, Phase I Investigation for Closure of 101 Area Surface Impoundments, Prepared for Day and Zimmermann/Basil Corporation.

Figures



Adapted from Boyle Engineering 1986; Reservation area based on USACE 1987

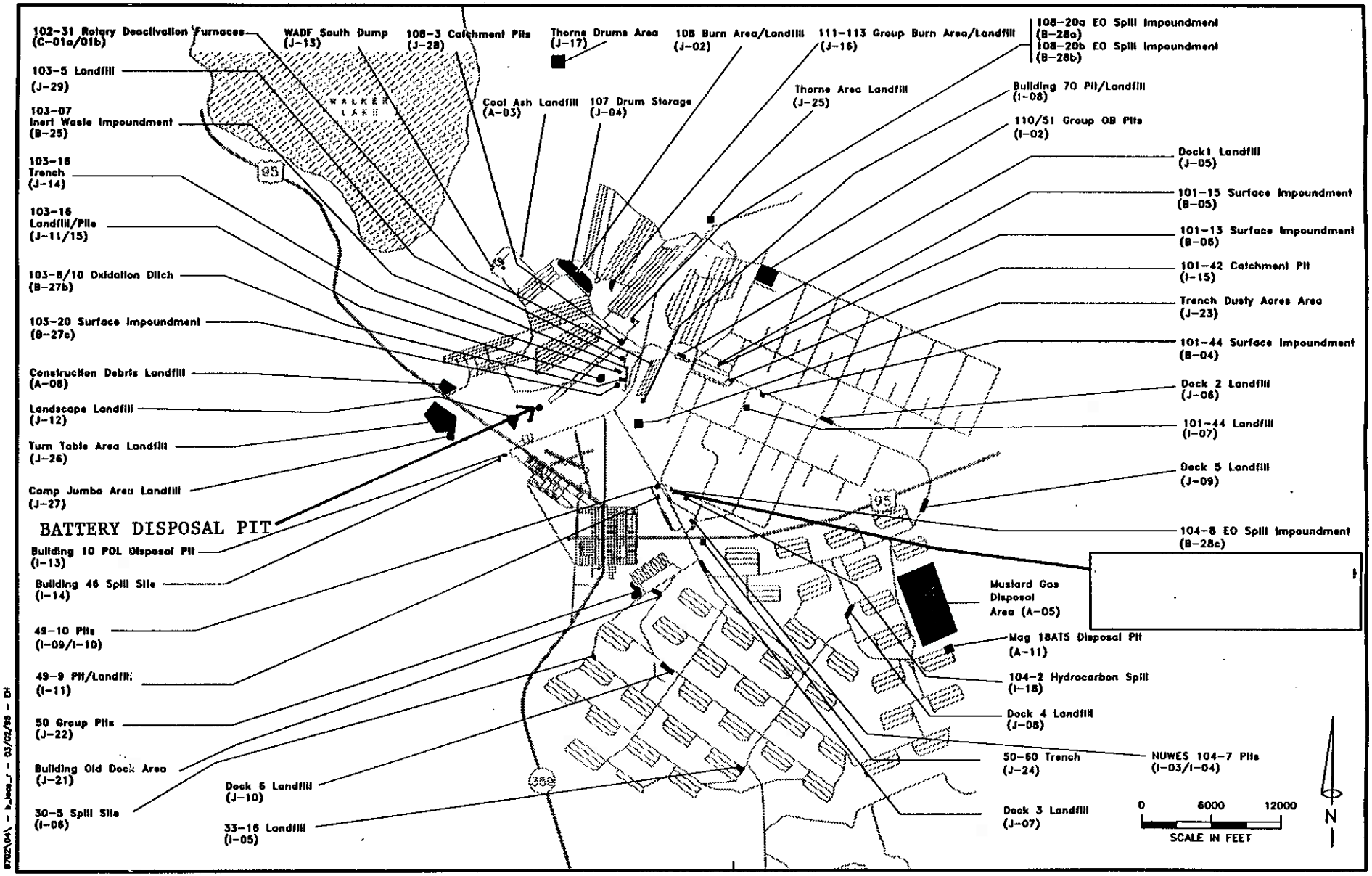
Location Map

Legend

Hawthorne Army Depot

Hawthorne Army Depot
Hawthorne, Nevada

Tetra Tech, Inc.



TETRA TECH

Location Map
Hawthorne Army Depot

Hawthorne, Nevada

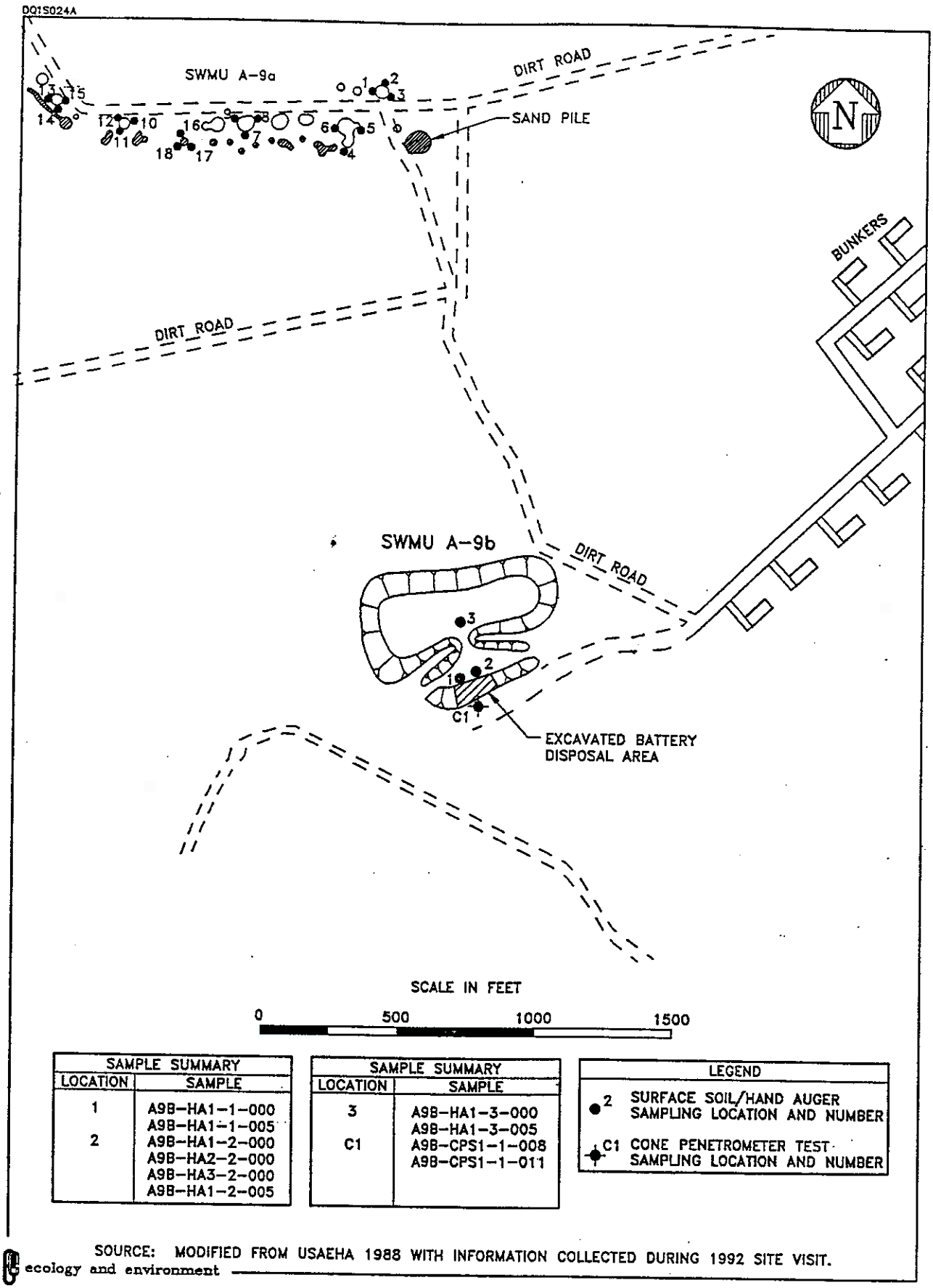


Figure 3-3 SAMPLE LOCATIONS AT SWMU A9b
BATTERY DISPOSAL AREA
HAWTHORNE ARMY DEPOT

Appendix A

Proposed Closure Goals
Hawthorne Army Depot
Hawthorne, Nevada

Constituent of Concern	Chemical Classification	Carcinogenic (C) or Non-carcinogenic (NC)	HWAD Proposed Closure Goals for Soil (mg/kg)	HWAD Proposed Closure Goal Source
Nitrate	Anion	NC	128,000	Calculated Subpart S[a]
2-Amino-dinitrotoluene	Explosive	NC	-	NA[b]
4-Amino-dinitrotoluene	Explosive	NC	-	NA
1,3-Dinitrobenzene	Explosive	NC	8	Calculated Subpart S
2,4-Dinitrotoluene	Explosive	NC	160	Calculated Subpart S
2,6-Dinitrotoluene	Explosive	NC	80	Calculated Subpart S
HMX	Explosive	NC	4,000	Calculated Subpart S
Nitrobenzene	Explosive	NC	40	Calculated Subpart S
Nitrotoluene (2-, 3-, 4-)	Explosive	NC	800	Calculated Subpart S
RDX	Explosive	NC	64	Calculated Subpart S
Tetryl	Explosive	NC	800	Calculated Subpart S
1,3,5-Trinitrobenzene	Explosive	NC	4	Calculated Subpart S
2,4,6-Trinitrotoluene	Explosive	C	233	Calculated Subpart S
Aluminum	Metal	NC	80,000	Calculated Subpart S
Arsenic (cancer endpoint)	Metal	C & NC	30	Background[c]
Barium and compounds	Metal	NC	5,600	Calculated Subpart S
Beryllium and compounds	Metal	C	1	Background
Cadmium and compounds	Metal	NC	40	Calculated Subpart S
Chromium III and compounds	Metal	NC	80,000	Calculated Subpart S
Lead	Metal	NC	1000	PRG[d]
Mercury and compounds (inorganic)	Metal	NC	24	Calculated Subpart S
Selenium	Metal	NC	400	Calculated Subpart S
Silver and compounds	Metal	NC	400	Calculated Subpart S
Acenaphthene	PAH	NC	4,800	Calculated Subpart S
Benzo[a]anthracene	PAH	C	0.96	Calculated Subpart S
Benzo[a]pyrene	PAH	C	0.10	Detection Limit[e]
Benzo[b]fluoranthene	PAH	C	0.96	Calculated Subpart S
Benzo[k]fluoranthene	PAH	C	10	Calculated Subpart S
Chrysene	PAH	C	96	Calculated Subpart S
Dibenz[ah]anthracene	PAH	C	0.96	Calculated Subpart S
Fluoranthene	PAH	NC	3,200	Calculated Subpart S
Fluorene	PAH	NC	3,200	Calculated Subpart S
Indeno[1,2,3-cd]pyrene	PAH	C	-	NA
Naphthalene	PAH	NC	3,200	Calculated Subpart S
Pyrene	PAH	NC	2,400	Calculated Subpart S
Total Petroleum Hydrocarbons as Diesel (TPH-d)	PAH	C	100	NDEP Level Clean-up[f]
Polychlorinated biphenyls (PCBs)	PCBs	C	25	TSCA[g]
Bis(2-ethylhexyl)phthalate (DEHP)	SVOC	C	1,600	Calculated Subpart S
Bromoform (tribromomethane)	SVOC	C	89	Calculated Subpart S

Appendix B

Table G-1

LIST OF ANALYTES FOR INORGANICS (METALS) ANALYSES

Method Reference	Method Number	Brief Description of Method	Matrix (soil/water)	Quantitation Limit[a]
Metals Sample Preparation				
SW-846	3010	ICP Digestion	Water	NA
SW-846	3050	ICP Digestion	Soil	NA
Arsenic				
SW-846	7060	Furnace AA	Water	5 µg/L
SW-846	7060	Furnace AA	Soil	0.5 mg/kg
Barium				
SW-846	6010	ICP	Water	20 µg/L
SW-846	6010	ICP	Soil	2.0 mg/kg
Beryllium				
SW-846	6010	ICP	Water	5 µg/L
SW-846	6010	ICP	Soil	0.5 mg/kg
Cadmium				
SW-846	6010	ICP	Water	5 µg/L
SW-846	6010	ICP	Soil	0.5 mg/kg
Chromium				
SW-846	6010	ICP	Water	10 µg/L
SW-846	6010	ICP	Soil	1 mg/kg

Table G-1

LIST OF ANALYTES FOR INORGANICS (METALS) ANALYSES

Method Reference	Method Number	Brief Description of Method	Matrix (soil/water)	Quantitation Limit[a]
Lead[b]				
SW-846	7421	Furnace AA	Water	5 µg/L
SW-846	7421	Furnace AA	Soil	0.5 mg/kg
SW-846	6010	ICP	Water	75 µg/L
SW-846	6010	ICP	Soil	7.5 mg/kg
Mercury				
SW-846	7470	Cold Vapor	Water	0.2 µg/L
SW-846	7471	Cold Vapor	Soil	0.1 mg/kg
Selenium				
SW-846	7740	Furnace AA	Water	5 µg/L
SW-846	7740	Furnace AA	Soil	0.5 mg/kg
Silver				
SW-846	6010	ICP	Water	10 µg/L
SW-846	6010	ICP	Soil	1.0 mg/kg

Note: Detection Limits are target values and may be affected by matrix. Completeness objectives for all parameters are 95% unless stated otherwise.

[a] ASC reporting levels. Instrument detection limits are determined quarterly and are at or below the levels in the table.
[b] Samples that are non-detect for lead by Method 6010 will be reanalyzed by Method 7421.

Key:

NA =Not applicable.

SW-846: EPA "Test Methods for Evaluating Solid Wastes," SW-846, 3rd edition, Update I, July 1992.

Appendix C

Table G-2

LIST OF ANALYTES FOR INORGANICS (NON-METALS) ANALYSES

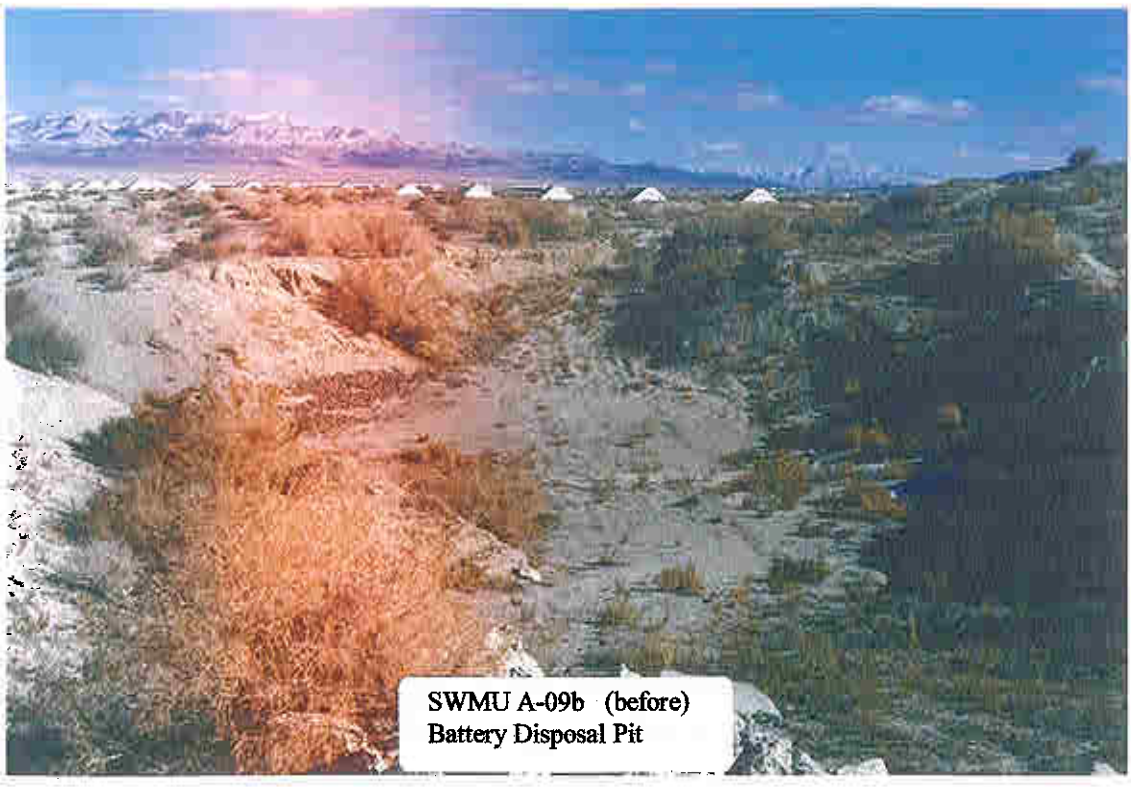
Method Reference	Method Number	Brief Description of Method	Matrix (soil/water)	Quantitation Limit[a]
Nitrate				
EPI	353.2	Cd Reduction/Colorimetric	Water	0.01 mg/L
EPI	m353.2[b]	Cd Reduction/Colorimetric	Soil/Solid	1 mg/kg[c]
Ammonia				
EPI	350.3	Ion Selective Electrode	Water	0.03 mg/L
pH				
SW-846	9045	Combination Electrode	Soil/Solid	± 0.1 pH unit

[a] ASC reporting levels.
[b] Modified for the analysis of soils.
[c] Infrequent test - approximate quantitation limit.

Key:

NA =Not applicable.
EPI =EPA "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-79-020, revised March 1983.

SW-846: EPA "Test Methods for Evaluating Solid Wastes," SW-846, 3rd edition, Update I, July 1992.



SWMU A-09b (before)
Battery Disposal Pit

SWMU A-09b (after)
Battery Disposal Pit